Phenolic, antioxidant, and sensory heterogeneity of enological tannins: what are their possible winemaking applications?

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AIM: The aim of this work was to characterize 18 oenological tannins by the polyphenolic, antioxidant, and sensory point of view. These properties have been evaluated in model wine solution as well as in red wine added with these tannins to observe matrix effects and therefore to assess their performances in a real condition. METHODS: Polyphenolic content (A280, Folin-Ciocalteu, proanthocyanidins assay) and antioxidant properties (ABTS, DPPH, FRAP, CUPRAC) were studied in a model wine solution (12 % ethanol, 4 g/L tartaric acid, pH 3.5). Bitterness and astringency sensory analysis (Descriptive Analysis) of selected formulations (40 g/hL) was performed in water and in red wine. After 1 month, the tannin-added wines were evaluated in terms of polyphenolic content (A280), antioxidant capacity (DPPH, FRAP), total anthocyanins, and polymerized pigments. RESULTS: Antioxidant properties of oenological tannins and their influence on wine characteristics were strongly affected firstly by their polyphenolic richness, followed by their origin. In particular, the great antioxidant capacity of hydrolysable tannins was evident in both model wine solutions and wines after one month. Ellagitannins, thanks to this property, also led to an increased percentage of wine polymeric pigments with respect to the control whereas gallotannins showed low polymerization ability. Good performances were evidenced also by Acacia tannins additions in terms of increased polymeric pigments ratio. Moreover, quebracho formulations showed the highest perceived astringency and bitterness, but only in water solutions. In the same medium, ellagitannins exhibited a low value of bitterness and astringency but, on the contrary, they were perceived as astringent in red wine highlighting a significant matrix effect. CONCLUSIONS: Phenolic content and antioxidant properties of tannin formulations in model wines are correlated with the characteristics of wines after one month. Among others, ellagitannins confirmed their potentialities in added wine regarding increased antioxidant capacity and polymeric pigments ratio. Nevertheless, astringency and bitterness are affected in different extent by the matrix, highlighting the influence of wine features on the final product sensory properties.

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